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RED-CLOVER FAILURE

IN RELATION TO ANTHRACNOSE IN THE SOUTHERN PART OF THE CLOVER BELT

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U. S. DEPARTMENT OF AGRICULTURE

A disease of red clover prevalent in some of the Southern States is described in this leaflet.

A remedy for the trouble is discussed, and measures are outlined for the production of seed of resistant strains or for the more advantageous use of seed from nonresistant strains.

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RED-CLOVER FAILURE IN RELATION TO ANTHRACNOSE IN THE SOUTHERN PART OF THE CLOVER BELT

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Clover Failure

There are various reasons for the failure of red clover, but in the area south of Pennsylvania and the Ohio River an important, though little-recognized, cause is a disease called anthracnose or scorch. There are two forms of anthracnose, one in the South and another in the North, though the areas in which these forms are found overlap to an unknown extent. The less destructive northern form is chiefly injurious to the seed crop, but the southern form is destructive to the clover at all stages of growth. The discussion that follows relates to the southern form only.

If an attack of scorch occurs after grain harvest, the seedling clover plants of susceptible stock may die while the farmer does not realize what is happening or blames the weather. If the stand survives, the yield from the first cutting the following year may be reduced, and the second crop may be a complete failure. While seedling plants of resistant parentage may become infected, they usually outgrow the disease and maintain good stands. Many so-called cases of winter injury are no doubt due to a severe thinning of the stand during the previous summer or to the death during winter of plants already weakened by disease. In such cases the fungus has attacked the crown and upper part of the root, and, while the plants may survive during cool, moist weather, they die as soon as the soil dries (fig. 1). When a fair-to-good stand has survived the winter and the fungus attacks the first growth of the second year, the disease is most severe on the succulent stems, where it develops elongated black lesions. If the first growth escapes with little damage and weather conditions are right, the disease may enter the crowns and prevent the development of the second growth.

Symptoms

The presence of scorch may be suspected when patches of clover in a field turn brown, especially if the leafstalks break and the dead leaves hang down (fig. 2) or when stems become blackened and there are long sunken streaks on the stem. Such areas may look as if they had been burned; hence the popular name "scorch." If the first cutting is fair to good and then many of the plants die after cutting, leaving the field spotted, or even in extreme cases bare, scorch is quite certainly responsible.

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FIGURE 1.—Anthracnose injury on the taproot at soil level. Note the black area and wilted leaves. A plant injured as this one is dies before winter.

Cause and Spread

The cause of this disease is a fungus which grows on the clover plant, causing affected parts to die, or, when the fungus enters the crown, causing whole plants to die. The fungus develops in the plant,

FIGURE 2.—Red-clover leaves attacked by anthracnose. Note the way the leaf stem is dried up at the point of attack.

and the spores, or reproductive parts, are developed on the blackened lesions. Anthracnose is at its worst during periods of hot weather when there is abundant moisture. Under such conditions spores are produced rapidly, and when carried to healthy plants these may develop the disease within 3 or 4 days. Spattering rain at such a time is probably the most effective means of distributing the fungus. Although new lesions are produced most rapidly in moist weather, it

often happens that the effects of the disease are not noticeable until a dry period causes the infected plants to wilt and change color. The injury is then frequently attributed to "drying out," even though there may be plenty of moisture in the soil. When cool weather comes the attack is checked, and slightly affected plants may entirely recover. The fungus, however, remains in the field on diseased plants and, as soon as conditions are favorable, may be carried to healthy plants.

Control

Experiments at the Arlington Experiment Farm, Rosslyn, Va., at Knoxville, Tenn., and elsewhere have shown that the use of seed

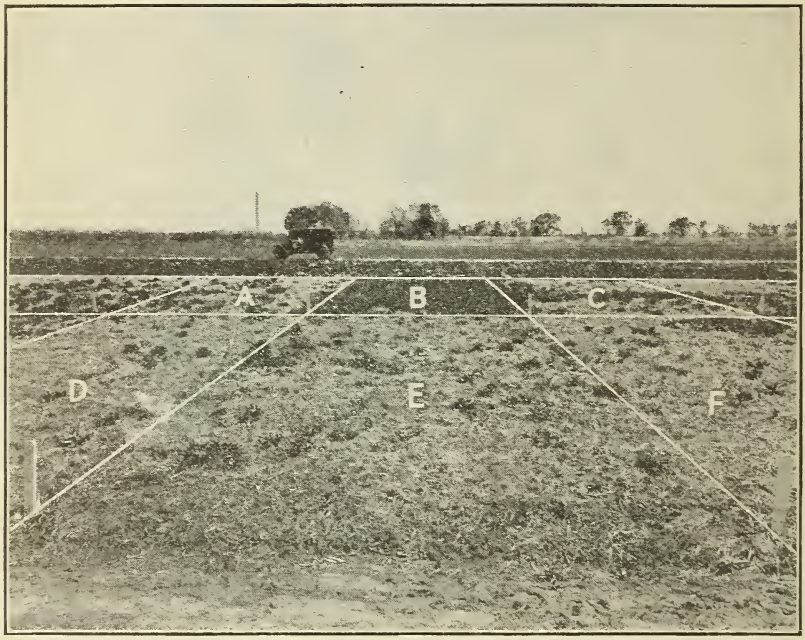

FIGURE 3.—Destruction by anthracnose of red clover of several strains, while plants of the Tennessee strain were uninjured: A, From Italy; B, from Tennessee; C, from the Netherlands; D, from Poland; E, from Oregon; F, from Denmark.

of a strain of red clover resistant to the disease is the one sure means for controlling this disease and avoiding serious loss. Such a resistant strain was selected many years ago by the University of Tennessee, and experience at the Arlington farm and elsewhere in the South has shown that good crops may be harvested when seed of this strain is used, while plants from foreign seed or from seed of nonadapted American origin go down with the disease (fig. 3).

Experience has shown also that seed from certain sections in the United States may produce plants highly resistant to scorch. In such cases natural selection would appear to have operated to produce a result brought about by conscious selection in Tennessee.

Wherever scorch is commonly present and red clover has been grown for seed over many generations, the clover may be expected

to be highly resistant to this disease. One such area is the "Northern Neck" of Virginia, where red-clover seed has long been produced. Seed from this region, known to have been grown from the same stock for many generations, has given good results when tested at the Arlington farm. There are probably other regions where similar conditions prevail.

Seed Supplies

Seed of the Tennessee anthracnose-resistant strain is grown in Tennessee, and limited quantities may be obtained from that State. Seed of this strain is also being grown in parts of Oregon and Idaho. Up to this time seed grown for two generations in Oregon has been tested at the Arlington farm and has been found to yield as well as seed of this strain produced in Tennessee, while yields from native Oregon stocks have been inferior because of attacks of anthracnose. It is too early to state whether this apparent resistance will continue indefinitely, but the record so far has been satisfactory.

It is not possible to delimit definitely the areas in which red-clover seed satisfactory for sowing in the southern part of the clover belt may be produced. The anthracnose disease is not always equally severe, and in seasons during which the attack is mild almost any American-grown red-clover seed may give a crop. The use of resistant seed is recommended, however, as it is impossible to predict in advance when a severe season may occur. The experience at the Arlington farm shows definitely that when the disease is severe better results are secured from Tennessee anthracnose-resistant seed or from seed grown in Virginia, Indiana, Kentucky, or parts of Ohio than from seed grown in Canada, Michigan, Wisconsin, or Minnesota.

There is, however, only one strain that has been definitely tested for anthracnose resistance, and that is the Tennessee anthracnose-resistant strain. Under favorable conditions red-clover seed other than from this strain may yield as well, but it would be a misnomer to describe such seed as anthracnose-resistant.

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